

10 20 30 40 50 60 70 80 90 100 110 120 130

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**Growth Investigations of Wild and
Hatchery Steelhead in the Lower
Feather River
SP-F10 Task 3b**

How to Observe Growth

- Enclosures
 - Hold steelhead for up to 3 months
 - Monitor growth every 2 weeks
- Mark and Recapture Experiments
 - Capture wild steelhead, mark and return to river
 - Recapture every 2-4 weeks

Marking Steelhead

Nose Mark



Caudal Peduncle Mark



Elastomer Mark

Enclosure Locations

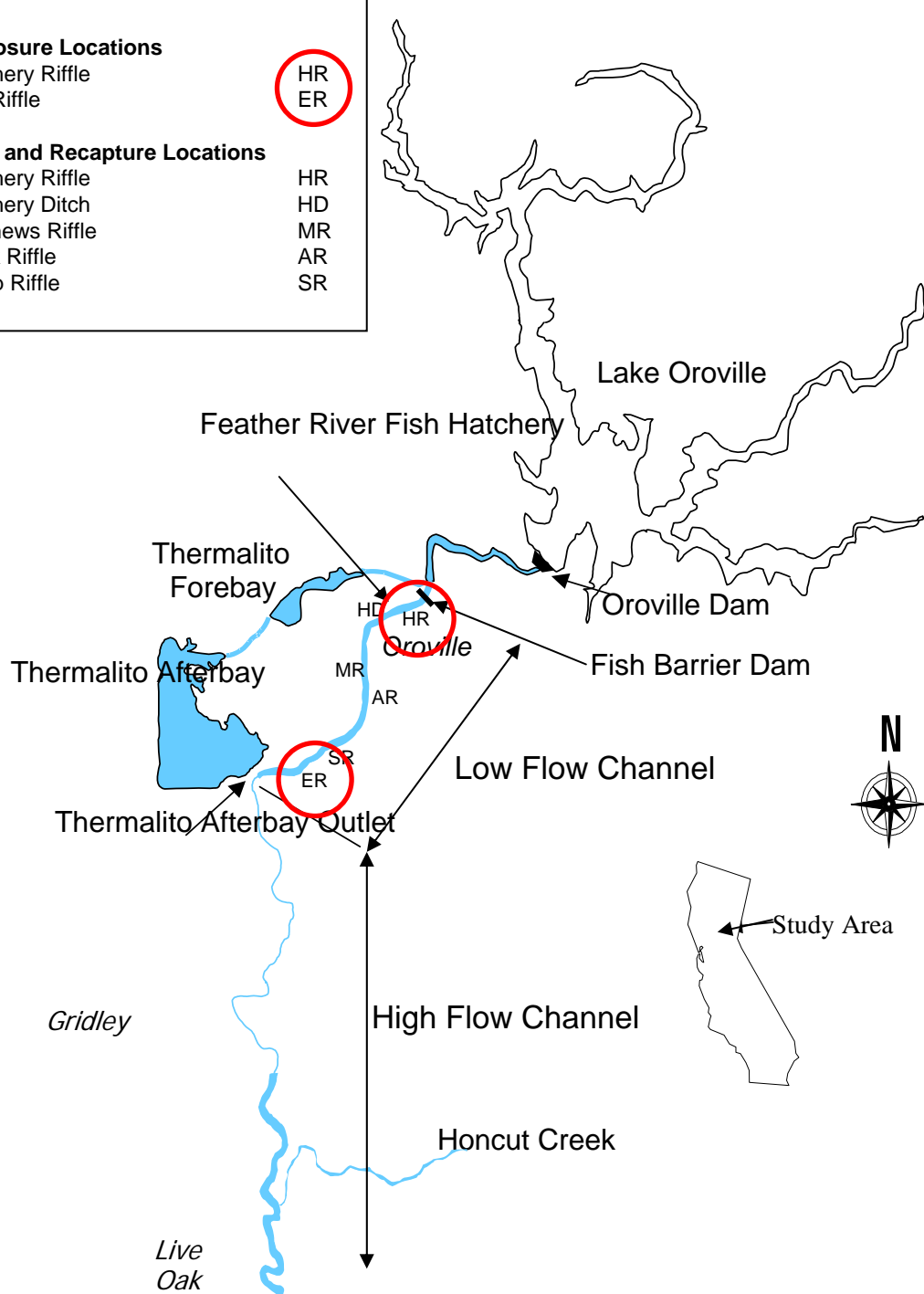
Hatchery Riffle
Eye Riffle

HR
ER

Mark and Recapture Locations

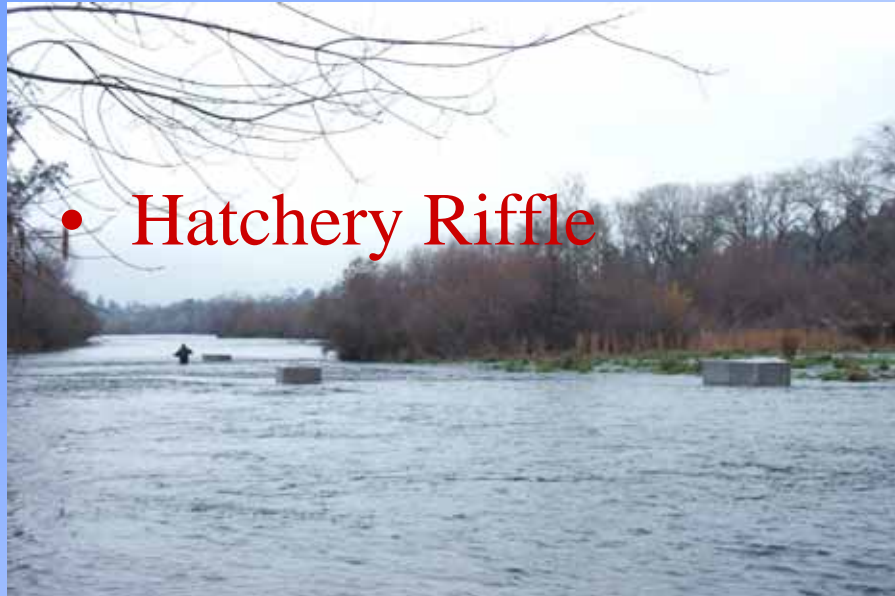
Hatchery Riffle
Hatchery Ditch
Matthews Riffle
Aleck Riffle
Steep Riffle

HR
HD
MR
AR
SR



Enclosure Placement

- Hatchery Riffle



- Eye Riffle Side Channel

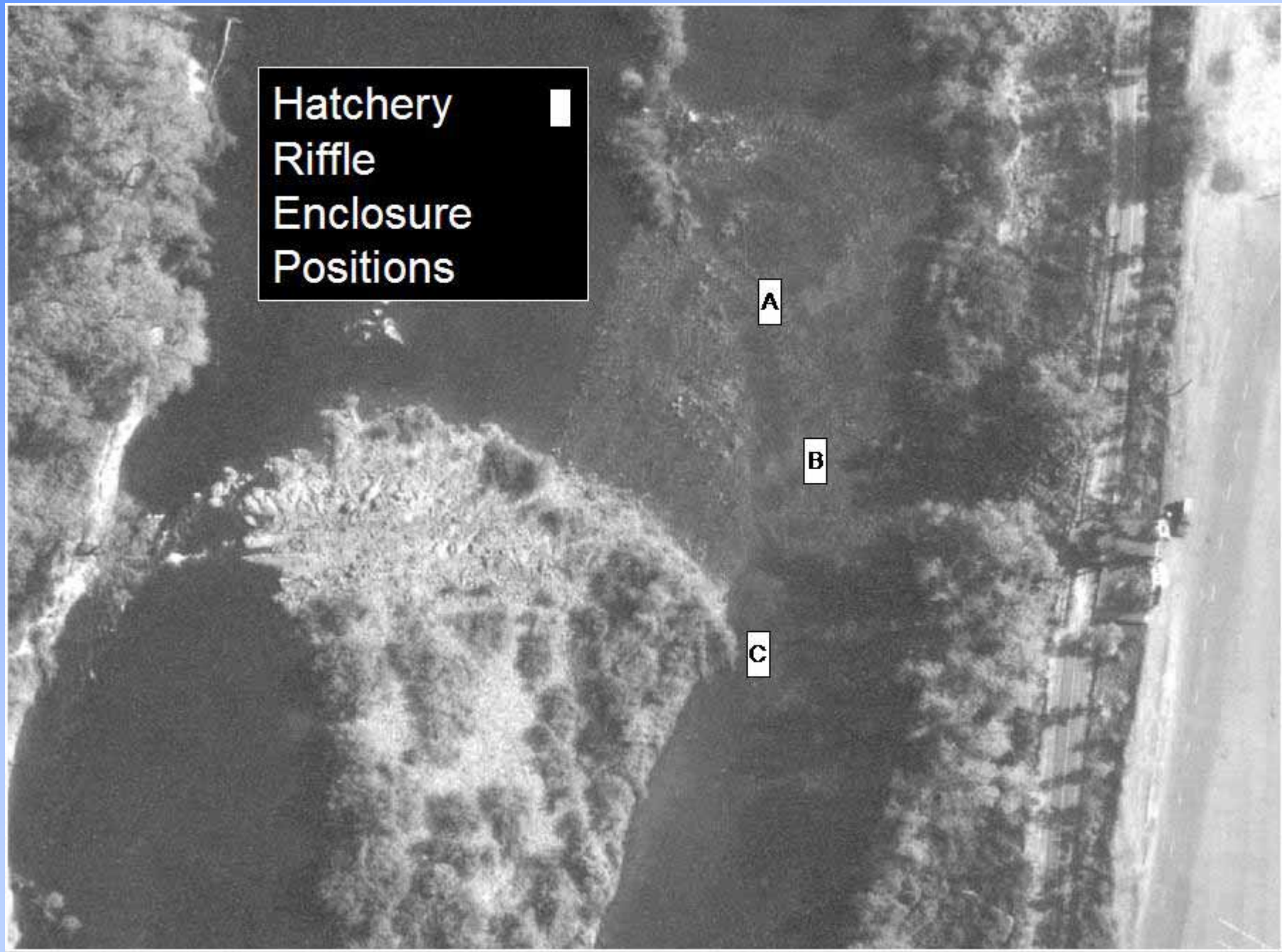


Hatchery
Riffle
Enclosure
Positions

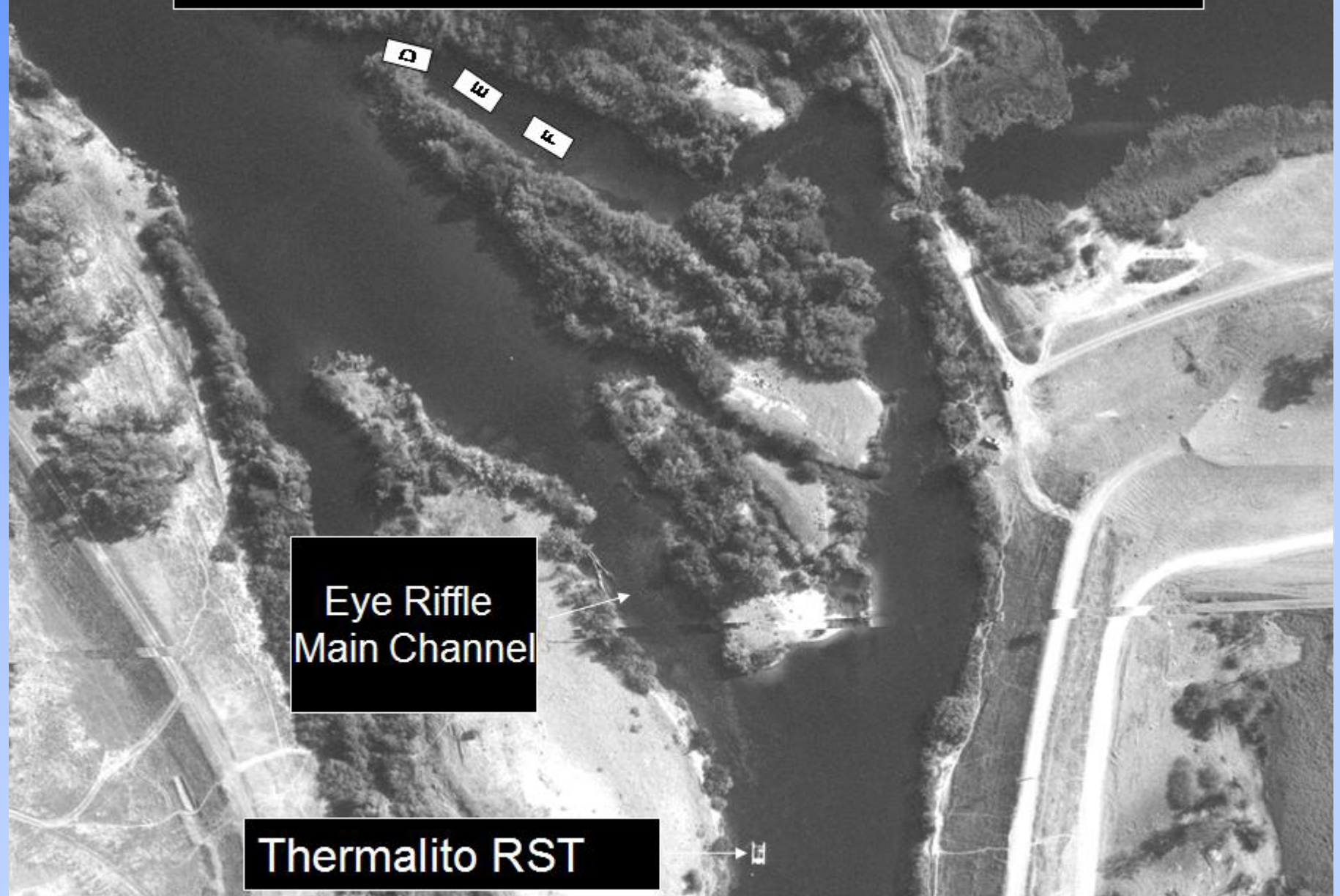
A

B

C



Eye Riffle Side Channel Enclosure Positions



Enclosure Design



Enclosure Design-Front & Rear



Enclosure Design-Sides



Enclosure Design-Sides

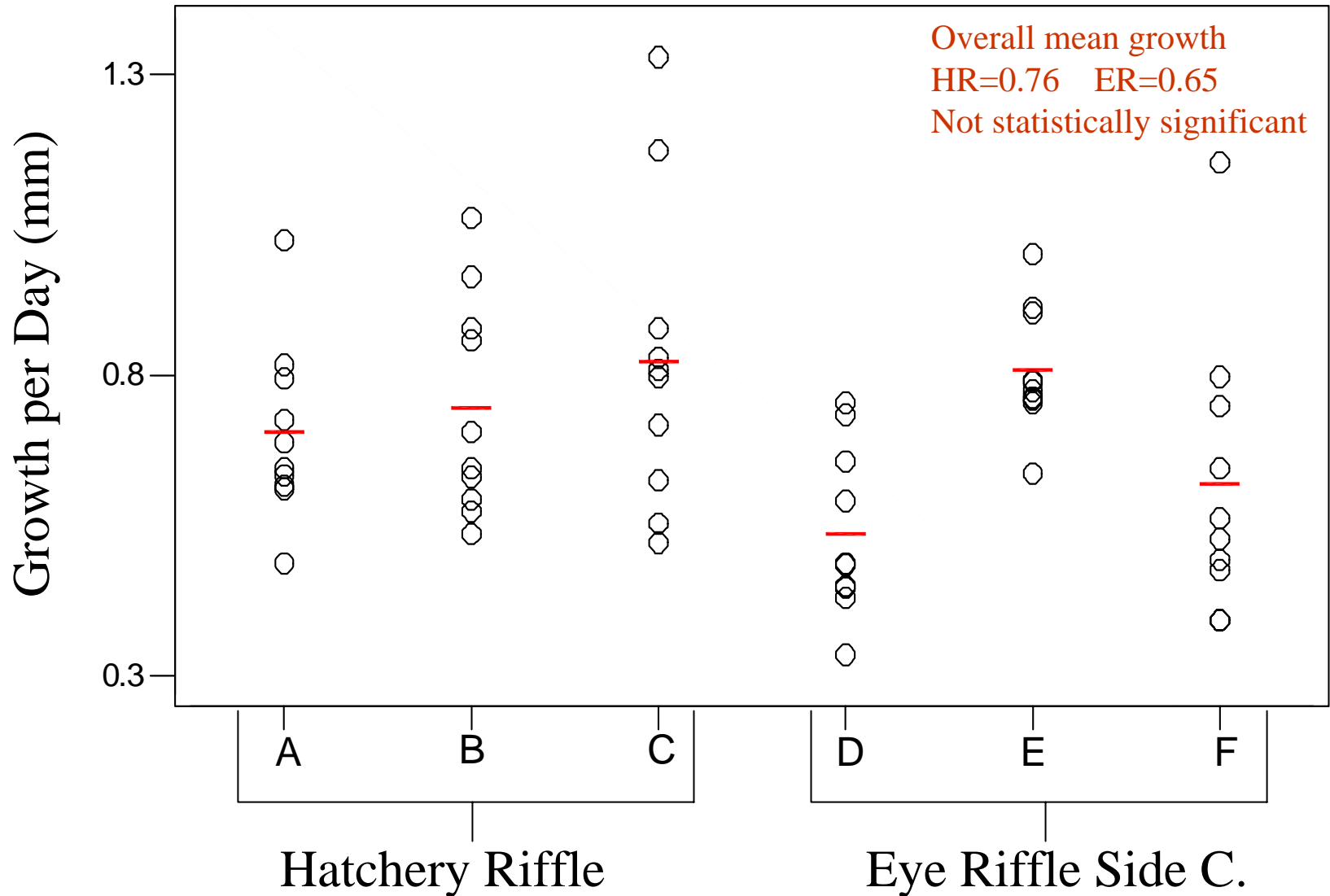


Enclosure Results

- Growth Rates
- Temperature
- Invertebrate Densities

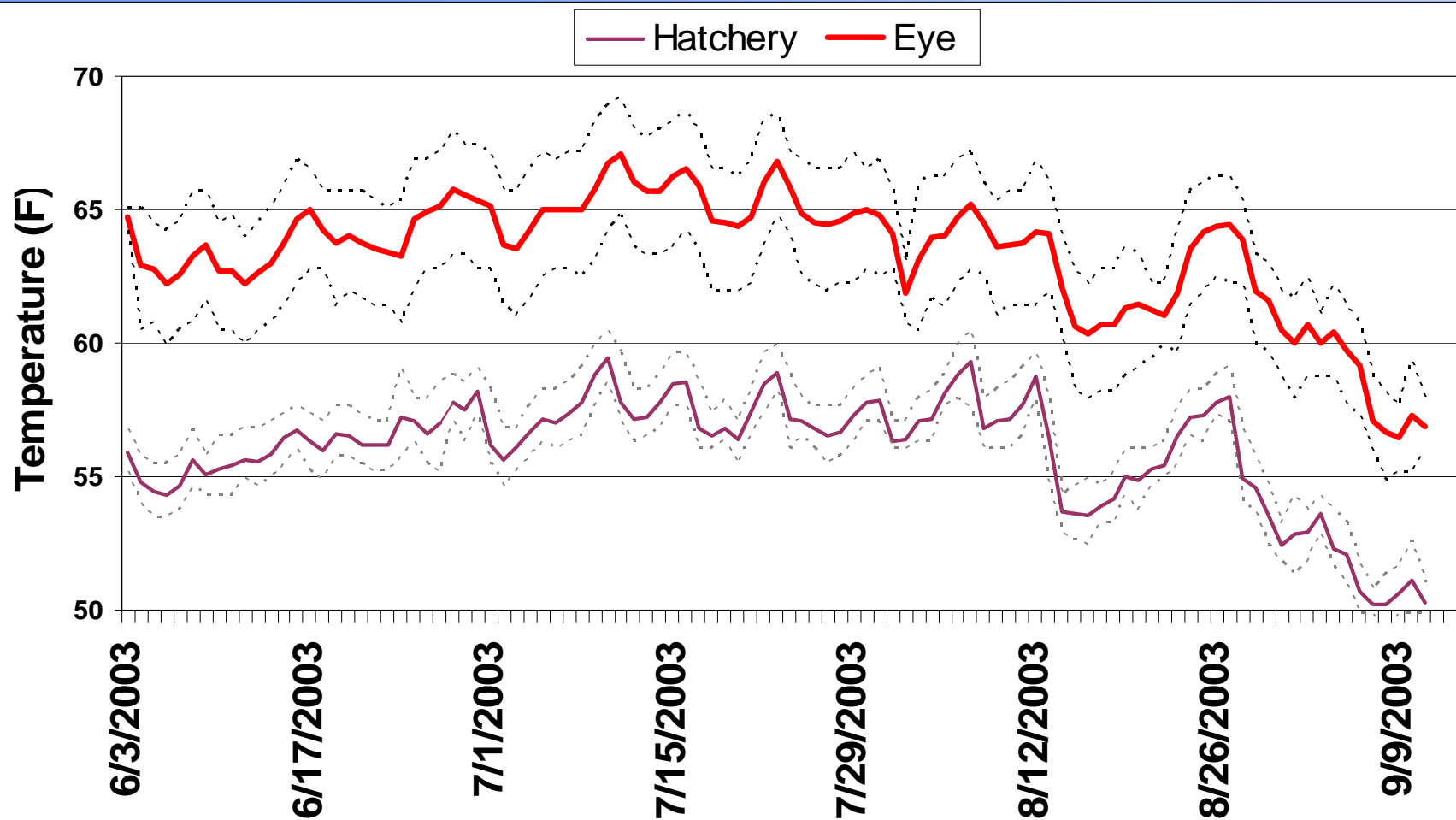
Enclosure Growth Simplified

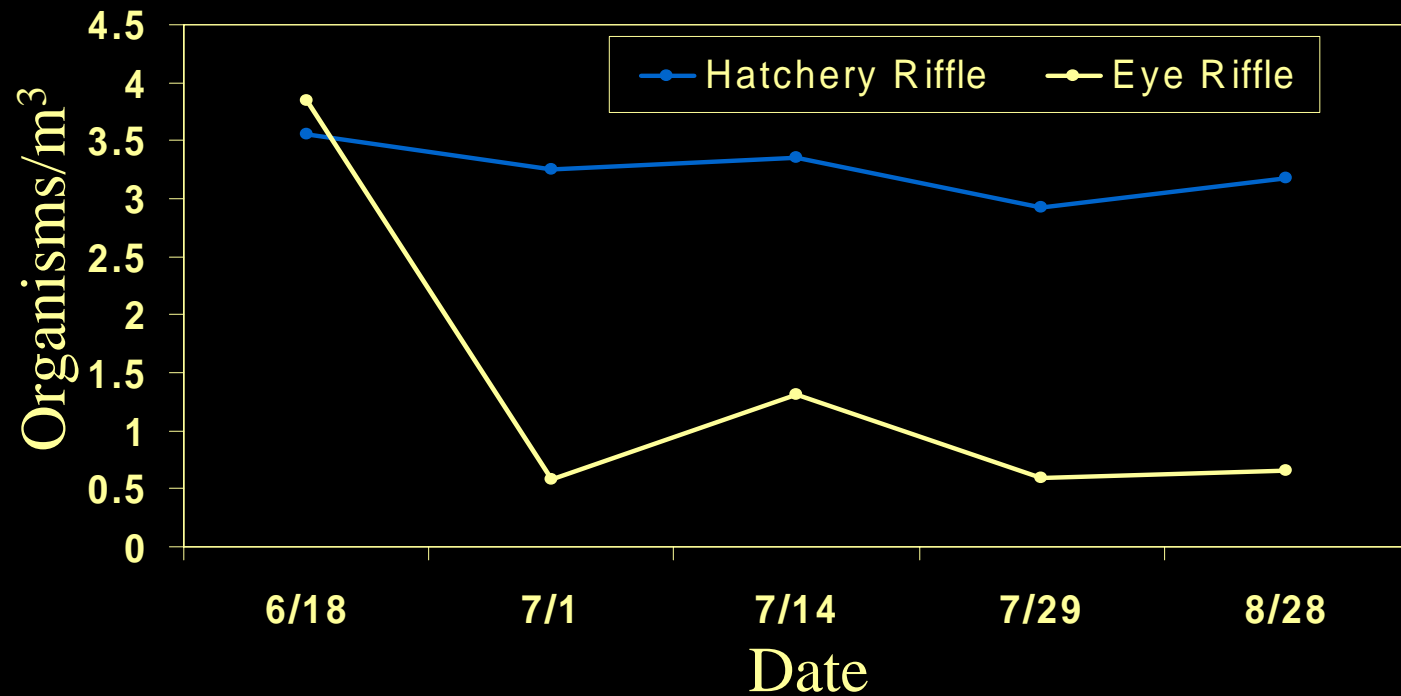
(group means are indicated by lines)



Mean Daily Temperature at Hatchery And Eye Riffles

(with min -- and max--)





Percent Abundance

Taxon	HR	ER	stomachs*
Diptera	61.9	19.5	82.3
Ephemeroptera	11.9	16.8	10.9

* Feather River steelhead, Esteban 2002

Enclosure Summary

- No significant difference in growth
 - Length or weight
- Eye Riffle consistently warmer than Hatchery
 - ~6-8° F
- Difference in drift abundance
 - CPUE of drift organisms about 3 fold greater at Hatchery Riffle
 - Rank abundance not statistically different, but proportions of primary food sources were
 - Diptera, Ephemeroptera

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Mark and Recapture Sampling to Monitor Steelhead Growth

- Capture and mark juvenile steelhead throughout the LFC at 5 locations

Capture/Recapture

Hatchery Riffle
Hatchery Ditch
Aleck Riffle
Matthews Riffle
Steep Riffle

Recapture Only

Bedrock Park
Eye Riffle

Enclosure Locations

Hatchery Riffle

Eye Riffle

HR

ER

Mark and Recapture Locations

Hatchery Riffle

Hatchery Ditch

Matthews Riffle

Aleck Riffle

Steep Riffle

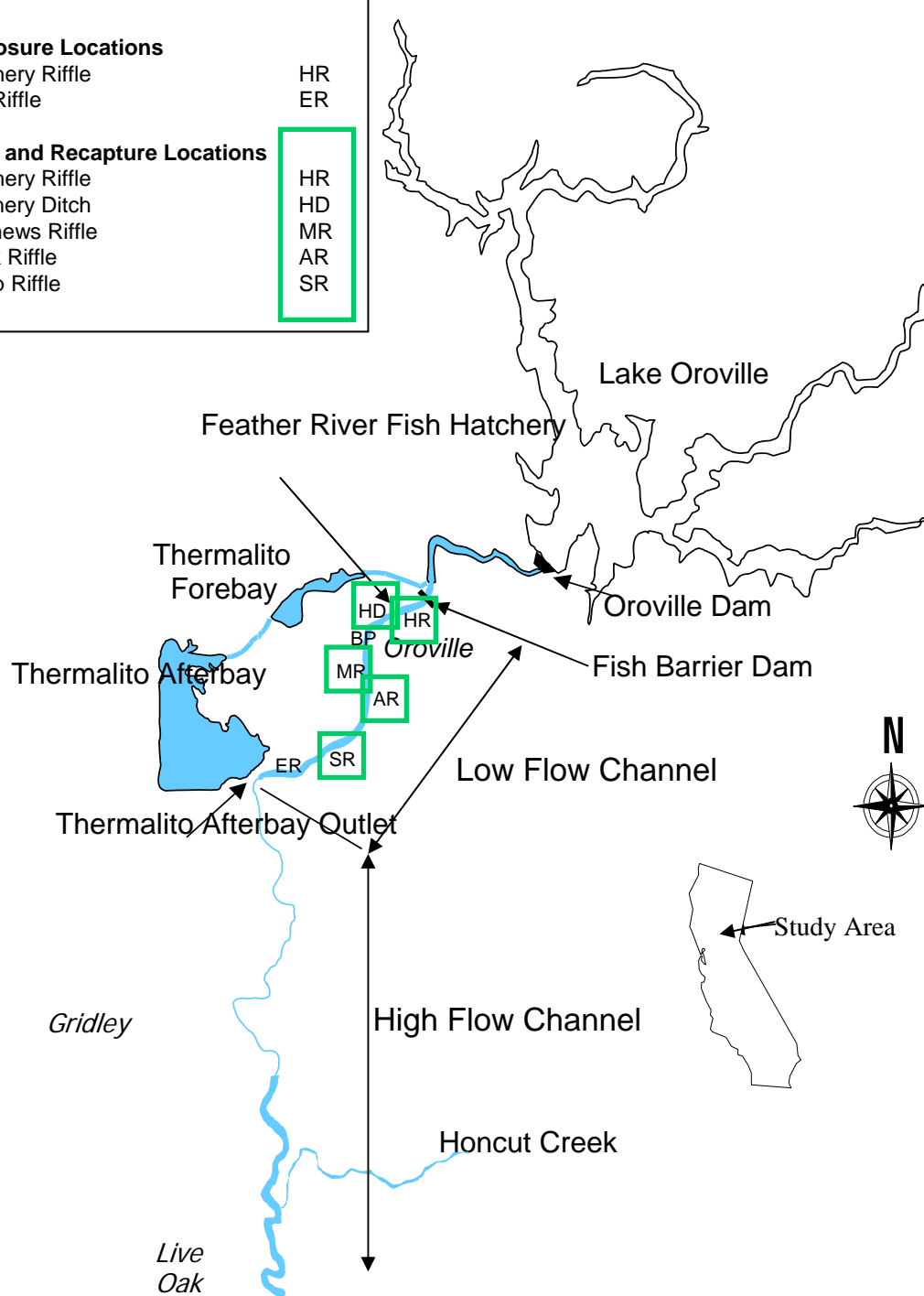
HR

HD

MR

AR

SR



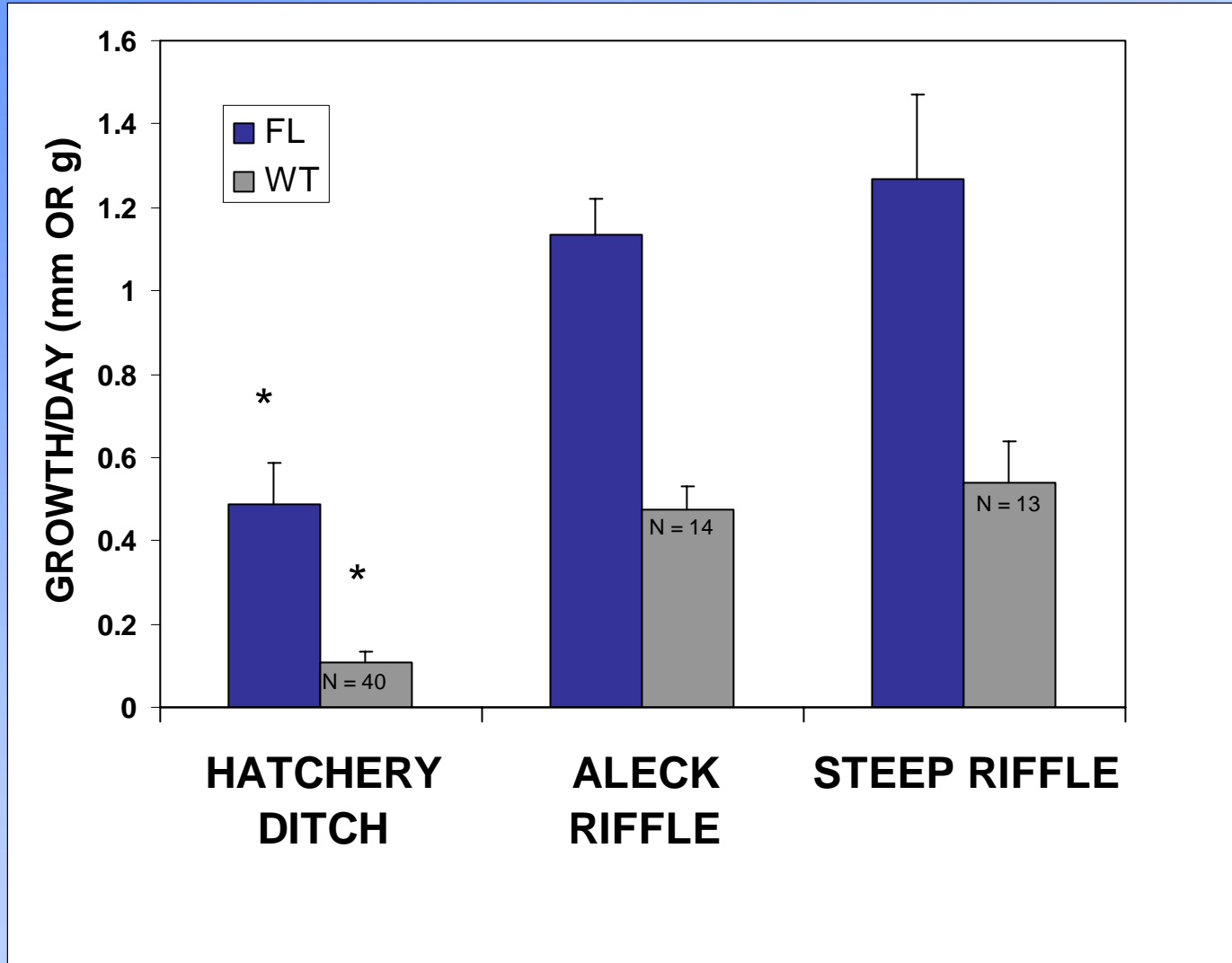
Mark and Recapture Results

- 631 steelhead marked
- 88 recaptured (13.9%)
- 77 recaptured where marked (87.5%)

Mean fork length of wild steelhead from M-R surveys

Location (River Mile)	Mean FL mm (SD)
Hatchery Riffle (66.7)	62.2 (18.9)
Hatchery Ditch (66.6)	69.7 (16.9)
Matthews Riffle (64.1)	94.5 (33.3)
Aleck Riffle (63.5)	89.1 (21.0)
Steep Riffle (61.0)	100.0 (37.2)

Daily Growth of Steelhead Marked and Recaptured in 2003

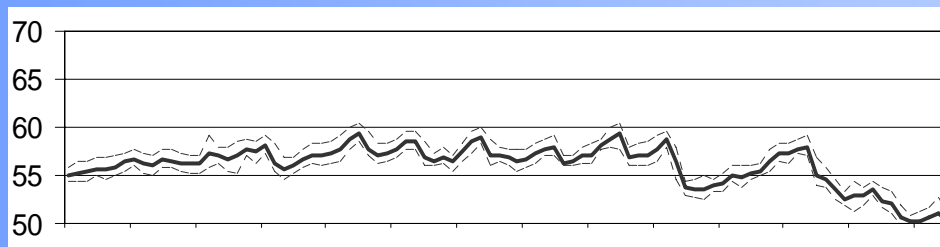


* Hatchery Ditch growth was significantly different from Aleck and Steep.

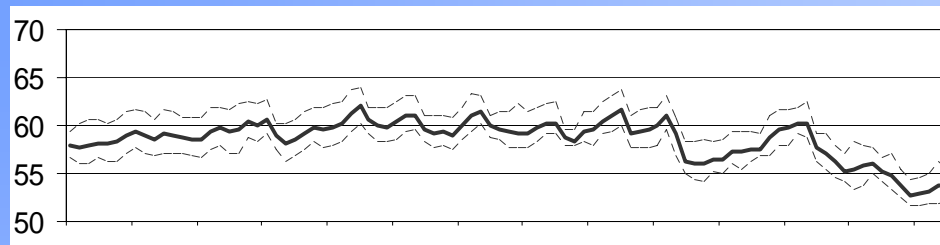
Why Differences in Growth?

- **Temperature**
- Food Production
- Density

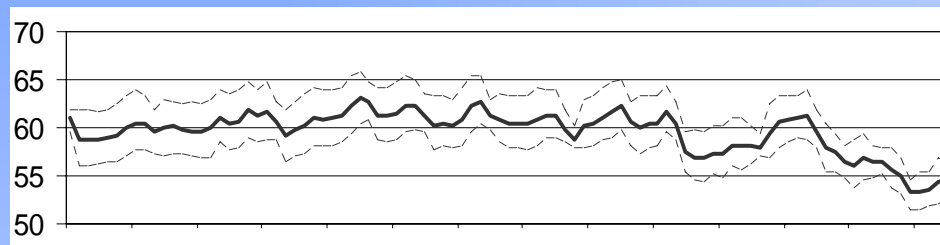
Temperature (F)



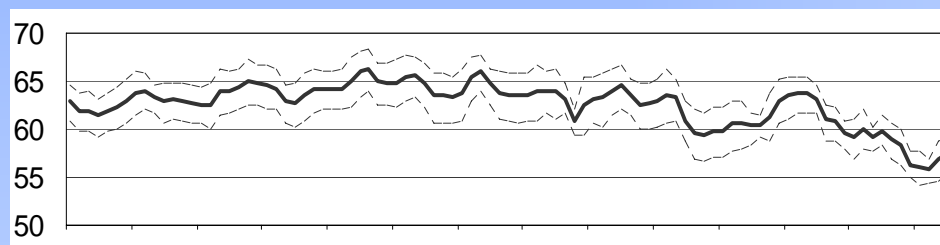
Hatchery Riffle



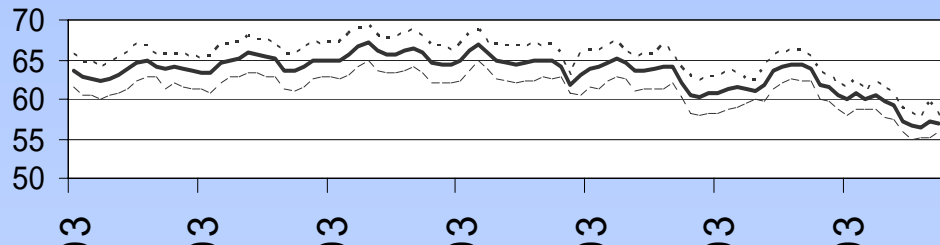
Bedrock



Aleck



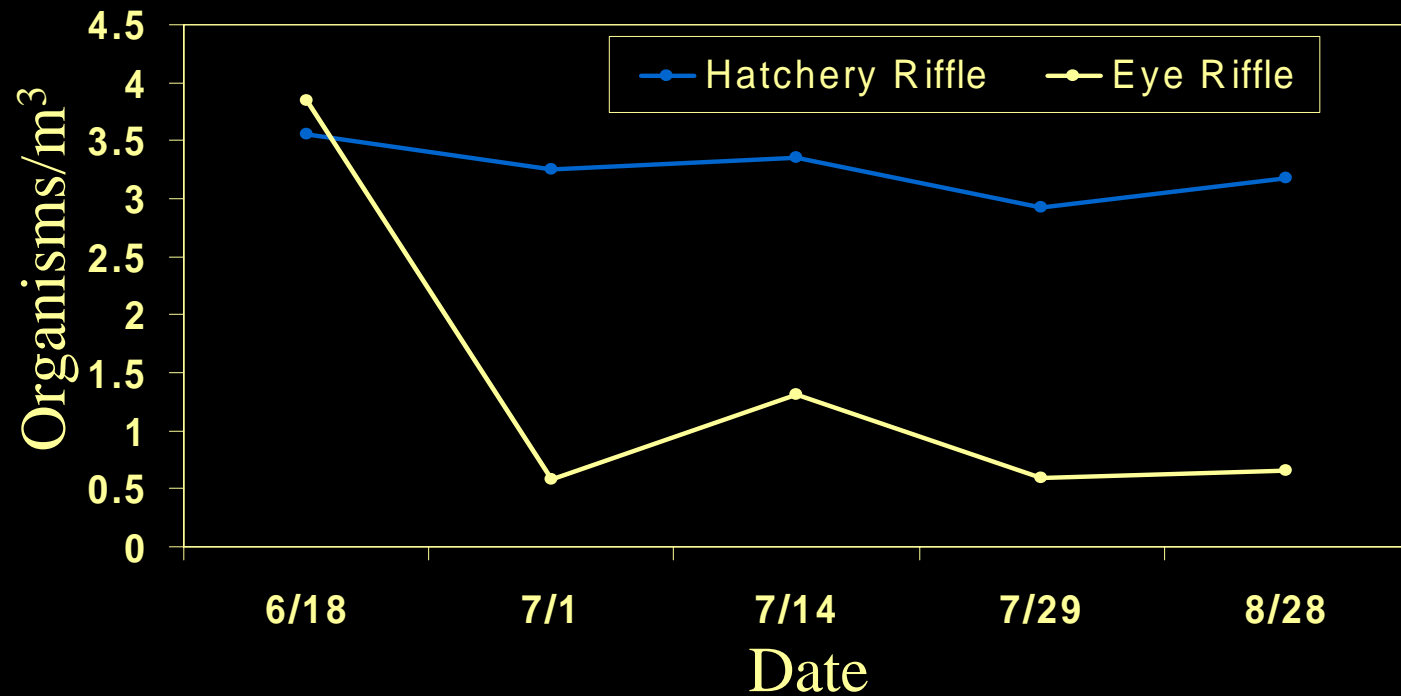
Steep



Eye

Why Differences in Growth?

- Temperature
- **Food Production**



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Mark and Recapture Summary

- Growth of wild steelhead was significantly faster downstream
 - Temperature is probably driving force
- Little movement
 - Most steelhead content to rear in same location throughout the study period

Questions/Issues

- Why did enclosed steelhead grow at similar rates in both locations when wild steelhead did not?
- Vandalism is a major issue: Enclosures need additional refinements to prevent data loss.
- Mark/Tag refinement: Use of PIT tags will eliminate tag error and provide longer term data sets.

Conclusions

- Juvenile steelhead appear to grow fast in the LFC-faster in downstream locations.
- Temperatures appear suitable for rearing throughout the LFC.
- Juvenile steelhead move little in the LFC.
- More work is needed to confirm/expand current results.